

FUNCTIONAL SPECIFICATION

FOR AN

ADVANCED METERING INFRASTRUCTURE

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**FUNCTIONAL SPECIFICATION
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1.0 APPLICATION OF SPECIFICATION

This Specification sets the required minimum level of functionality for AMI in the Province of Ontario for residential and small general service consumers where the metering of demand is not required. This Specification is not intended to apply to net metering applications.

2.0 FUNCTIONAL SPECIFICATION

2.1 *Deployment*

This Specification shall be met regardless of the size or scope of the AMI deployment by a distributor.

2.2 *Minimum Functionality*

2.2.1 As a minimum:

2.2.1.1 AMI shall collect Meter Reads on an hourly basis from all AMCDs deployed by a distributor and transmit these same Meter Reads to the AMCC and MDM/R, as required, in accordance with these Specifications; and

2.2.1.2 A Meter Read shall be collected, dated and time stamped at the end of each hour (i.e. midnight as represented by 24:00).

2.2.2 The date and time stamping of Meter Reads shall be recorded as year, month, day, hour, minute (i.e. YYYY-MM-DD hh:mm).

2.2.3 All meters shall have a meter multiplier of one (1).

2.2.4 Distributors shall provide the MDM/R with the service multiplier for transformer-type meters.

2.3 *Performance Requirements*

2.3.1 Collection and Transmission of Meter Reads:

2.3.1.1 AMI shall successfully collect and transmit to the AMCC and MDM/R at least 98.0% of the Meter Reads from all AMCDs deployed by a distributor in any Daily Read Period.

2.3.1.2 Meter Reads unsuccessfully collected or transmitted shall not be due to the

same AMI component (including, without limitation, any AMCD) during any three (3) month consecutive time period.

- 2.3.1.3 AMI shall be able to collect and transmit Meter Reads during its operating life without requiring a field visit.
- 2.3.2 **Transmission Accuracy:** Over the Daily Read Period, 99.9% of the Meter Reads received by the AMCC shall contain the same information as that collected by all AMCDs deployed by the distributor.
- 2.3.3 AMI shall be capable of providing Meter Reads with a precision of at least 10 Watt-hours (0.01 kWh).

2.4 Technical Requirements

- 2.4.1 When an AMI includes AMRCs, the AMRCs shall have the ability to store meter data to accommodate the performance requirements in section 2.3.1.
- 2.4.2 **Time Synchronization:**
 - 2.4.2.1 AMI shall be operated and synchronized to Official Time, as set by the National Research Council of Canada.
 - 2.4.2.2 AMI shall have the capability of adjusting for changes due to local daylight savings time.
 - 2.4.2.3 AMI installed within a distributor's service area shall have the capability of accommodating more than one (1) time zone.
 - 2.4.2.4 Time synchronization shall be maintained in the AMI to the specified accuracy parameters set out in section 2.4.3.1 following a loss of power.
 - 2.4.2.5 All Meter Reads shall adhere to accurate time synchronization processes to ensure an accurate accounting of electricity consumption at each meter.
- 2.4.3 **Time Accuracy:**
 - 2.4.3.1 At all times, time accuracy in the AMI shall not exceed a ± 1.5 minute variance from the time established in section 2.4.2.1.
 - 2.4.3.2 AMI shall be able to prove that time accuracy does not exceed the permitted time variance identified in section 2.4.3.1.
- 2.4.4 **Loss and Restoration of Power:**
 - 2.4.4.1 AMI shall detect and identify the interval in which a loss of power occurred during a Daily Read Period.
 - 2.4.4.2 AMI shall detect and identify the interval in which power was restored following a loss of power.

2.4.5 Environmental Tolerances: All AMI components (except the AMCC) shall operate and meet the requirements in these Specifications within a temperature range of minus thirty degrees Celsius (-30° C) to positive sixty-five degrees Celsius ($+65^{\circ}$ C), and within a humidity range of zero percent (0%) to ninety-five percent (95%) non-condensing.

2.5 Advanced Metering Communication Device (AMCD)

2.5.1 Installation Within the Meter:

2.5.1.1 The AMCD shall not impair the ability of the meter to be visually read.

2.5.1.2 Meters in which an AMCD is installed shall be able to be installed in existing meter sockets or enclosures.

2.5.1.3 AMCD shall meet or exceed ANSI standards to withstand electrical surges and transients.

2.5.2 Labelling:

2.5.2.1 The AMCD shall be permanently labelled with:

- (1) Legally required labelling;
- (2) Manufacturer's name;
- (3) Model number;
- (4) AMCD identification number;
- (5) Input/output connections;
- (6) Date of manufacture; and
- (7) Bar code for tracking and inventory management.

2.5.3 When installed at a consumer's location, the meter shall visibly display, as a minimum, the AMCD identification number, meter serial number and LDC badge number for the meter.

2.5.4 The AMCD shall be able to be initialized or programmed during, or prior to, field installation.

2.6 Transmission of Meter Reads

2.6.1 All Meter Reads collected during the Daily Read Period shall be received by the AMCC and transferred to the MDM/R no later than 5:00 a.m. local time following the Daily Read Period.

2.6.2 Meter Reads are not required to be transmitted in a single transmission and may be transmitted as frequently as necessary in order to meet the requirements in section 2.6.1.

2.6.3 AMCC shall transfer the information identified in section 2.6.1 using an approved protocol and file structure.

2.7 Advanced Metering Regional Collectors (AMRC)

2.7.1 LAN Communication Infrastructure:

2.7.1.1 The spectrum allocation and wattage of the radio signal used by an AMI shall not impede neighbouring frequencies.

2.7.2 When an AMI includes AMRCs:

2.7.2.1 The AMI shall provide for the continuous powering of AMRCs regardless of their location and placement.

2.7.2.2 All AMCDs shall be able to collect and transmit Meter Reads when one or more AMRC has a loss of power.

2.7.2.3 Memory and software parameters shall be maintained at all AMRC during a loss of power, whether by the provision of backup/alternate power or other solution.

2.8 Advanced Metering Control Computer (AMCC)

2.8.1 Each AMCC shall have the ability to store a rolling sixty (60) days of Meter Reads.

2.8.2 A distributor shall not aggregate Meter Reads into rate periods or calculate consumption data from the Meter Reads collected through its AMI either in its AMCC or any other component.

2.8.3 The AMCC shall be able to perform basic operational verification of Meter Reads received before transmitting these Meter Reads to the MDM/R.

2.9 Customer Account Information

2.9.1 Distributors shall provide initial information associated with customer accounts to the MDM/R on a date to be determined.

2.9.2 On an ongoing basis, distributors shall provide information associated with any change to the initial information identified in section 2.9.1 to the MDM/R at a frequency to be determined.

2.9.3 Information to be provided to the MDM//R pursuant to sections 2.9.1 and 2.9.2 is to be determined.

2.10 Monitoring & Reporting Capability

2.10.1 The AMI shall have non-critical reporting functionality and critical reporting functionality as required in this section 2.10. Information generated from this reporting functionality shall be available to the MDM/R.

2.10.2 Non-critical reporting:

2.10.2.1 At the completion of every Daily Read Period and following a transmission of Meter Reads, the AMCC shall generate a status report that includes information regarding anomalies and issues affecting the integrity of the AMI or any component of the AMI including information related to any foreseeable impact that such anomalies or issues might have on the AMI's ability to collect and transmit Meter Reads.

2.10.2.2 In addition to section 2.10.2.1, the AMCC shall generate reports:

- (1) Confirming successful initialization of the AMCD's installed in the field;
- (2) Confirming data linkages among an AMCD identification number, LDC badge number, serial number and customer account;
- (3) Confirming that the MDM/R has successfully received notification of any changes to customer account information;
- (4) Confirming that the AMCC has successfully made changes to customer account information following receipt of same from the MDM/R;
- (5) Confirming the successful collection and transmission of Meter Reads or logging all unsuccessful attempts to collect and transmit Meter Reads, identifying the cause, and indicating the status of the unsuccessful attempt(s) pursuant to section 2.3.1;
- (6) Confirming the accuracy of the Meter Reads received by the AMCC pursuant to section 2.3.2;
- (7) Confirming that all Meter Reads have a precision of at least 10 Watt-hours (0.01 kWh) pursuant to section 2.3.3;
- (8) Confirming whether the Meter Reads acquired within the Daily Read Period are in compliance with the time accuracy levels identified in section 2.4.3;
- (9) Confirming whether time synchronization within the AMI or any components of the AMI has been reset within the Daily Read Period;
- (10) Identifying the intervals in which a loss of power occurred and at which power was restored, following a loss of power;
- (11) Addressing the functionality of the AMCD communication link, including status indicators related to the AMCD and AMRC;
- (12) Identifying suspected instances of tampering, interference and theft;

- (13) Flagging potential network, meter and AMCD issues; and
- (14) Identifying any other instances that impact or could potentially impact the AMI's ability to collect and transmit Meter Reads to the AMCC and/or MDM/R on a daily basis.

2.10.2.3 Following a transmission of Meter Reads or at the completion of every Daily Read Period, the information in section 2.10.2.2 (5) shall be stored and used by the AMCC to assess compliance with the requirement specified in section 2.3.1.2.

2.10.2.4 The reports generated in sections 2.10.2.1 and 2.10.2.2 shall be made available to the MDM/R with a frequency to be determined.

2.10.3 Critical reporting:

Critical events are defined to include any AMI operational issue that could adversely impact the collection and transmission of Meter Reads during any Daily Read Period.

2.10.3.1 The AMI shall identify and report the following to the distributor:

- (1) AMCD failures;
- (2) AMRC failures;
- (3) Issues related to the storage capacity of any component of the AMI;
- (4) Communication links failures;
- (5) Network failures; and
- (6) Loss of power and restoration of power.

2.10.3.2 The reports generated in section 2.10.3.1 shall be made available to the MDM/R.

2.11 Security and Authentication:

2.11.1 The AMI shall have security features to prevent unauthorized access to the AMI and meter data and to ensure authentication to all AMI elements.

2.12 Proven Technology

2.12.1 No distributor shall install more than five hundred (500) units of a particular model of electricity AMCD if a minimum of five thousand (5,000) units of the same model of electricity AMCD that is to be installed by the distributor is not currently functioning in the field as part of one or more functioning AMI.

2.13 Regulatory Requirements

2.13.1 The AMI shall meet all applicable federal, provincial and municipal laws, codes, rules, directions, guidelines, regulations and statutes (including any requirements of any

applicable regulatory authority, agency, board, or department including Industry Canada, the Canadian Standards Association, the Ontario Energy Board and the Electrical Safety Authority) (collectively, “**Laws**”). For greater certainty, the AMI shall meet all applicable Laws that are necessary for the measurement of data and/or the transmission of data to and from the consumers within the Province of Ontario, including Laws applicable to metering, safety and telecommunications.

2.14 Water or Natural Gas Meter Reads

2.14.1 The AMI should be capable of supporting an increased number of Meter Reads associated with the reading and transmission of water and/or natural gas meters through additional ports on the AMCD, through optionally available multi-port AMCDs, or through additional AMCD/AMRC devices that are compatible with operating on the AMI. When procuring AMI, distributors shall obtain an indication of the capabilities of the proposed AMI to read water and natural gas meters, indicating the makes and models of such meters that can be read, and any requirements for retrofitting them.

3.0 DEFINITIONS

Within this Specification the following words and phrases have the following meanings:

“**AMCC**” is an advanced metering control computer that is used to retrieve or receive and temporarily store Meter Reads before or as they are being transmitted to the MDM/R. The information stored in the AMCC is available to log maintenance and transmission faults and issue reports on the overall health of the AMI to the distributor.

“**AMCD**” is an advanced metering communication device that is housed either under the meter’s glass or outside the meter. It transmits Meter Reads from the meter directly or indirectly to the AMCC.

“**AMI**” means an advanced metering infrastructure. It includes the meter, AMCD, LAN, AMRC, AMCC, WAN and related hardware, software and connectivity required for a fully functioning system that complies with this Specification. With some technologies, an AMI does not include AMRCs. An AMI does not include the MDM/R.

“**AMRC**” is an advanced metering regional collector that collects Meter Reads over the LAN from the AMCD and transmits these Meter Reads to the AMCC.

“**consumer**” or “**customer**” means a person who uses, for the person’s own consumption, electricity that the person did not generate.

“**distributor**” has the meaning provided in the *Ontario Energy Board Act, 1998*.

“**Daily Read Period**” means the 24-hour period for collecting Meter Reads, subject to the two periods annually during which changes to and from daylight savings time take place. The Daily Read Period ends at 12:00 midnight of each day.

“**LAN**” means a local area network, the communication network that transmits Meter Reads from the AMCD to the AMRC.

“**meter multiplier**” is the factor by which the register reading must be multiplied to obtain the registration in the stated units.

“**Meter Read**” is a number generated by a meter that reflects cumulative electricity consumption at a specific point in time.

“**MDM/R**” means the meter data management and meter data repository functions within which Meter Reads are processed to produce rate-ready data and are stored for future use.

“**Specification**” means these functional specifications.

“**transformer-type meter**” means a meter designed to be used with instrument transformers.

“**WAN**” means a wide area network, the communication network that transmits Meter Reads from the AMRC to the AMCC or, in some systems from the AMCD directly to the AMCC, and from the AMCC to the MDM/R.